



(12) **United States Patent**
Ludwig

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(54) **LED/OLED ARRAY APPROACH TO
INTEGRATED DISPLAY,
LENSLESS-CAMERA, AND TOUCH-SCREEN
USER INTERFACE DEVICES AND
ASSOCIATED PROCESSORS**

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(57) **ABSTRACT**

A system for implementing a display which also serves as one or more of a tactile user interface touchscreen, light field sensor, proximate hand gesture sensor, and lensless imaging camera. In an implementation, an OLED array can be used for light sensing as well as light emission functions. In one implementation a single OLED array is used as the only optoelectronic user interface element in the system. In another implementation two OLED arrays are used, each performing and/or optimized from different functions. In another implementation, an LCD and an OLED array are used in various configurations. The resulting arrangements allow for sharing of both optoelectric devices as well as associated electronics and computational processors, and are accordingly advantageous for use in handheld devices such as cellphone, smartphones, PDAs, tablet computers, and other such devices.

20 Claims, 21 Drawing Sheets

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(65) **Prior Publication Data**

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G09G 3/32 (2016.01)
G06F 3/041 (2006.01)

(52) **U.S. Cl.**
CPC **G06F 3/0412** (2013.01)

(58) **Field of Classification Search**
CPC G06F 3/0412
USPC 250/221; 345/82, 83
See application file for complete search history.

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